

**STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION**

STAFF REPORT FOR REGULAR MEETING OF May 11, 2007

Prepared on March 30, 2007

ITEM NUMBER:

SUBJECT: Perchlorate Cases

DISCUSSION:

Please refer to previous staff reports for historical information. Olin's latest monthly update to the Water Board is included as Attachment 1.

Background

Perchlorate is both a naturally occurring and man-made chemical, although it is rarely found naturally in the United States. One-third of all perchlorate used in the United States is used in California and 90% of California's perchlorate use is related to the aerospace industry. There are three major sources of perchlorate in the United States: ammonium perchlorate has been and continues to be used as an oxidizer in solid rocket propellant, sodium perchlorate is used in slurry explosives, and potassium perchlorate is used in road flares and air bag inflation systems. Wastes from the manufacture and improper disposal of perchlorate-containing chemicals are increasingly being discovered in soil and water.

Health Effects

Perchlorate is known to interfere with the natural function of the thyroid gland by inhibiting the uptake of iodide. Because iodide is an essential component of thyroid hormones, perchlorate disrupts how the thyroid functions. Such an effect decreases production of thyroid hormones, which are needed for prenatal and postnatal growth and development, as well as for normal body metabolism. Potassium perchlorate was used until recently to treat hyperthyroidism related to Grave's disease, and is still used diagnostically to test thyroid hormone production in some clinical settings.

Regulatory Standards

Currently there is no State or federal drinking water maximum contaminant level (MCL) for perchlorate. Both the U.S. Environmental Protection Agency (USEPA) and the California Department of Health Services (DHS) are in the process of studying the occurrence and health effects of perchlorate.

On March 12, 2004, the Office of Environmental Health Hazard Assessment (OEHHA) published a final public health goal of 6 micrograms per liter ($\mu\text{g/L}$) [or parts per billion (ppb)] for drinking water. The PHG is a public health-based drinking water goal used to establish the MCL. To date, DHS continues its internal process of conducting the technical and economic feasibility study to set California's perchlorate MCL. The DHS has proposed a primary MCL of 6 $\mu\text{g/L}$ for perchlorate. [The public may comment on the proposed regulation until 5 pm on February 16, 2007.](#)

Comment [R1]: Any updates on this?

Until an MCL is in place, DHS uses a 6 $\mu\text{g/L}$ advisory action level (or notification level) to protect consumers from perchlorate's potential adverse health effects. The DHS raised the action level from 4.0 to 6.0 on the same day the PHG was released. A notification level is an advisory level and is not an enforceable standard. When it is exceeded, a water purveyor is required to notify local governing

agencies and is recommended to issue a consumer notice. In addition, DHS recommends that a source of drinking water be taken out of service if perchlorate contamination exceeds 40 µg/L.

Treatment Methods

Treatment of perchlorate contamination in water is complicated because the perchlorate anion does not respond to typical water treatment techniques because of its fundamental physical and chemical nature. The perchlorate tetrahedron itself is structured such that the four oxygen atoms surround the central chlorine atom, effectively blocking reductants from directly attacking the chlorine. Although perchlorate is thermodynamically a strong oxidizing agent, it is a kinetically sluggish species, making its reduction generally very slow and rendering common reductants ineffective. It can persist in the environment for many decades under typical groundwater and surface water conditions because of its resistance to react with other available constituents.

Perchlorate treatment technologies may be generally classified into categories of destruction or removal technologies. Destructive processes include biological reduction, chemical reduction, and electrochemical reduction. Physical removal processes include anion exchange, membrane filtration (including reverse osmosis and nanofiltration), and electrodialysis, which all require subsequent disposal of removed perchlorate. The optimum treatment technology for a given perchlorate occurrence may depend on several factors, including perchlorate concentration, the presence and concentration of co-contaminants, other water quality parameters and geochemical parameters. The presence of indigenous perchlorate-reducing microbes and substances inhibitory to their activity will also influence perchlorate treatment technology effectiveness. For in-situ treatment of perchlorate contamination, variables related to the site hydrogeologic setting, such as depth to and distribution of contaminants, soil permeability, groundwater flow velocity, etc. are also additionally important.

Olin Corporation Facility, 425 Tennant Avenue, Morgan Hill, Santa Clara County

Project Manager: Hector Hernandez

Technical Support: Thea Tryon

The former Olin Corporation site is a 13-acre parcel located in southern Morgan Hill. Olin and Standard Fusee used potassium perchlorate in the manufacture of flares from 1956 to 1995. Olin manufactured signal flares at the facility for about 32 years from 1956 to 1988. Standard Fusee leased the site and manufactured signal flares for seven years from 1988 to 1995. Perchlorate was first detected at the site in August 2000 during a due diligence investigation by a potential buyer. Olin made initial contact with Central Coast Water Board staff regarding the perchlorate contamination in February 2001. Perchlorate contamination at the site may have occurred primarily from an unlined evaporation pond that received wastes from the cleaning of the ignition material mixing bowls, on-site incineration of cardboard flare coatings with residues on them, and accidental spills. The Central Coast Water Board never formally regulated waste disposal practices while the facility operated, but facility records do make reference to inspections by Water Board staff.

Groundwater in the region typically occurs in alluvial sediments, at depths ranging from 7 to 568 feet below ground surface. The alluvial deposits are composed of heterogeneous layers of clay, silt, sand, and gravel. Interconnected multiple aquifers exist within the area. Groundwater underneath the site is generally unconfined, although there are identified confined zones within the sub-basin to the southeast of the property. The groundwater flow direction is predominantly to the south-southeast with occasional variation to the south and south-southwest.

Current milestones in the investigation of perchlorate contamination emanating from the former Olin facility include:

CLEANUP ORDER NO. R3-2004-0101

Bottled Water Terminations: Central Coast Water Board staff continues to take a conservative approach in dealing with all issues related to bottled water service termination and monitoring requirements after bottled water service has been terminated. The users of private domestic supply wells in the Morgan Hill, San Martin, and Gilroy area depend on their well water as their main source of drinking water.

Olin continues to provide bottled drinking water to well owners and tenants whose wells have perchlorate concentrations greater than 6 µg/L. Olin provides bottled water in accordance with the Central Coast Water Board Cleanup or Abatement Order No. R3-2004-0101, as revised by the State Water Resources Control Board in its Order WQ 2005-0007 (State Water Board Order) and Central Coast Water Board staff's letter dated October 6, 2006. The October 6, 2006 letter provides comments and clarifies all our requirements related to issuance of replacement water (e.g., bottled water) and post bottled water termination monitoring. A copy of the October 6, 2006 letter addressing bottled water service termination is attached (see Attachment 2). Our letter indicates that after replacement water service has been terminated and the Central Coast Water Board's Executive Officer has concurred with the request to terminate bottled water service, the monitoring requirements described in our October 6, 2006 letter must be implemented. As required, the Executive Officer must approve the post-bottled water termination monitoring frequency for each well before the monitoring frequency is implemented.

Central Coast Water Board staff has carefully reviewed the analytical data and laboratory quality assurance/quality control (QA/QC) data and has determined that the State Water Board Order criteria have been met for seven phases of bottled water service termination. To date, Central Coast Water Board's Executive Officer has concurred with the request to terminate bottled water service for 518 wells. Central Coast Water Board staff will continue to review and evaluate all of the data submitted by Olin that is associated with bottled water terminations and post-bottled water termination monitoring.

Comment [R2]: Did we get to phase 8 yet?

Comment [R3]: Confirm this number with Thea.

Ion Exchange (IX) System Installations: As of November 30, 2006, Olin has installed IX systems on 16 domestic supply wells. Fourteen of the 16 IX units installed are operating as designed, system installation remains on hold at one well, and access approval has been received at the other well. Installation is not currently scheduled for one candidate well located on vacant property and another well is not being used as a potable source. Data evaluation continues for the other candidate wells. Olin is required to install IX systems on candidate wells that have had greater than 6.0 µg/L perchlorate detections during the past four quarters. Olin will continue providing bottled water to IX wells pending DHS acceptance of the domestic IX systems.

Comment [R4]: Updated?

CLEANUP ORDER NO. R3-2005-0014

Revised Cleanup Feasibility Study Report: On March 29, 2007, Central Coast Water Board staff completed its review and prepared comments concerning the following three technical reports:

Deleted: October 6, 2006

- December 6, 2006 Llagas Subbasin Cleanup Feasibility Study – Revised, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California (Revised Cleanup FS Report).
- December 6, 2006 Area I Plume Migration Control Feasibility Study, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California (Area I FS Report).
- December 6, 2006 Area I Plume Migration Control Work Plan, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California (Area I Work Plan).

Formatted: Bullets and Numbering

The purpose of these reports is to analyze alternatives for long-term, Llagas Subbasin-wide cleanup of groundwater degraded by perchlorate released at the Olin Corporation site. The three reports were

submitted on behalf of Olin and in accordance with Cleanup or Abatement Order No. R3-2005-0014 (Cleanup Order No. 0014) issued on March 10, 2005.

Olin originally submitted the Llagas Subbasin Cleanup Feasibility Study (Cleanup FS Report) to the Central Coast Water Board on June 30, 2006. Although the Central Coast Water Board conceptually agreed with Olin's proposed cleanup strategy, we required Olin to fully evaluate how the strategy complied with State Water Resources Control Board Resolution No. 92-49. Central Coast Water Board staff also required Olin to revise the original Cleanup FS Report to include additional supporting information regarding proposed remedial alternatives. Additionally, Central Coast Water Board staff required Olin to expedite active remediation in the highest concentration areas (Area I) by completing an Area I FS Report and to prepare an Area I Work Plan.

These reports describe objectives for groundwater quality restoration within the Llagas Subbasin and recommend a phased remediation approach to achieve these objectives. The phased remediation approach begins with hydraulic control and remediation of the plume core (the area of highest perchlorate concentrations in groundwater), and evaluates the need for additional active remediation in lower perchlorate concentration areas. The plume core cleanup is specifically addressed in the Area I FS Report and Area I Work Plan. The Revised Cleanup FS Report addresses perchlorate cleanup in groundwater outside the plume core.

Based on our review of the Revised Cleanup FS Report, background perchlorate levels in the Llagas Subbasin have not been determined. Further, Central Coast Water Board staff does not concur with Olin's proposed cleanup level. We do, however, concur with Olin's proposed groundwater remediation approach. It is our position that it is not productive to spend any additional time debating the background concentration at this time. Such debates only serve to delay implementation of active remediation of the most contaminated portions of the Llagas Subbasin. Implementation of active remediation must proceed immediately.

Formatted: Font: Bold, Font color: Blue

For now, Olin is required to proceed with groundwater remediation with the primary cleanup objective (goal) of achieving the background concentration¹ within each individual aquifer zone and throughout all affected portions of the Llagas Subbasin. Since Olin must at least achieve the maximum allowable cleanup level (6.0 µg/L), it is appropriate to use the maximum cleanup level as an interim groundwater cleanup goal. As groundwater cleanup proceeds, Olin must reevaluate the feasibility of achieving the primary cleanup goal (assuming that a background concentration has been established) or may reevaluate the feasibility of achieving an alternative groundwater cleanup level.

Formatted: Font: Bold, Font color: Blue

Central Coast Water Board staff believes it is premature to be able to know with certainty whether it will be feasible to clean up perchlorate impacted groundwater in a reasonable time within each individual aquifer zone to levels below the PHG. At this time, many uncertainties exist with respect to the effectiveness, expediency, and efficiency of the selected groundwater remedial strategy. Considering all of these unknowns and uncertainties, it is not prudent at this time to establish a cleanup level.

As additional data are collected and evaluated, including data associated with the Water District's forensic chemistry study (for background determination purposes) and ongoing performance monitoring data, and as the parties thoroughly evaluate the efficacy of the selected remediation strategy, the appropriateness of establishing an alternative cleanup level greater than background will be reevaluated. Further discussions and evaluation of establishing an appropriate cleanup level must take place concurrent with implementation of the phased groundwater remediation strategy proposed by Olin.

¹ If the implemented cleanup technology proves unsuccessful in achieving background in a technically and economically feasible manner, the Central Coast Water Board may adjust cleanup goals at a later stage of the cleanup.

Olin is directed to implement active remediation within the highest concentration areas expeditiously. As such, Central Coast Water Board approved Olin's Area I FS Report and Area I Work Plan for immediate implementation. Further, we also approved Olin's proposed phased remediation strategy, as outlined in the Revised Cleanup FS Report, provided Olin meets the following conditions:

1. By April 30, 2007, Olin must begin implementation of the Area I Work Plan and provide an Area I Well Installation Work Plan.
2. By May 15, 2007, Olin must prepare and provide an additional Cleanup Work Plan acceptable to the Executive Officer that details implementation plans for the selected and approved remedial alternative(s). The Llagas Subbasin Cleanup Work Plan shall, at a minimum, include the following elements:
 - a) A detailed implementation plan for the selected remedial alternative(s).
 - b) An updated time schedule for implementation, which must include a schedule for the restoration of beneficial uses (i.e., compliance with water quality objectives) of all affected aquifer zones within all assessment areas.
 - c) A Performance Monitoring Program to evaluate the performance and efficacy of the approved groundwater cleanup strategy within all assessment areas.
 - d) A detailed Remediation Contingency Plan to establish specific criteria that Olin will use to evaluate the effectiveness of the overall remediation strategy. Beginning on January 31, 2008, the Remediation Contingency Plan must include yearly updates to summarize the results of all the evaluations performed to date and include recommendations for system modification and or continued operation.
 - e) All other information deemed appropriate by Olin, or as specified by the Executive Officer in our concurrence with the Revised Cleanup FS Report and the two Area I reports.
3. Central Coast Water Board (or an appropriate designee) must review and evaluate MACTEC's nine-layer three-dimensional groundwater flow and mass transport model of the Llagas Subbasin.

Status of Issuance of Replacement Cleanup Order: Central Coast Water Board staff intends to issue an additional cleanup order that will replace Cleanup Order Nos. R3-2005-0014 and R3-2006-0112 in the near future. The replacement cleanup order will address the overall groundwater cleanup strategy and include a comprehensive cleanup implementation schedule and a groundwater cleanup level or goal for perchlorate in the areas of the Llagas Subbasin affected by the Olin Site. We anticipate the replacement cleanup order may be available for public comment by the summer of 2007. We anticipate the replacement order will be considered by the Central Coast Water Board at a public hearing rather than being issued by the Executive Officer.

Status of Monitoring and Reporting Program Revisions: Central Coast Water Board staff is in the process of updating, revising, and consolidating all monitoring requirements (MRP No. 2003-0168 and MRP No. 2001-161) into a new MRP. Central Coast Water Board staff and Olin recognize the need for a revised MRP that updates and incorporates all the monitoring requirements necessary to effectively monitor perchlorate concentrations over time, plume migration, and cleanup progress. The new MRP will include a detailed monitoring network to ensure that perchlorate concentrations are effectively monitored in specific areas of the plume to ensure that increasing trends in groundwater with perchlorate concentrations near 6.0 µg/L can be identified prior to these concentrations reaching domestic supply wells.

On March 9, 2007, Olin provided an update to the sampling and analysis plan and quality assurance project plan. Central Coast Water Board staff intends to work closely with Olin and its consultants during the revision process and plans to issue the new consolidated MRP in the near future.

Reports Under Review: By the date of this update, Central Coast Water Board staff has completed or is in the process of completing its review and preparation of comments, concerning the following reports:

Formatted: Bullets and Numbering

Formatted: Font: 10 pt, Not Italic

Formatted: Font: 10 pt

Formatted: Font: 10 pt, Not Italic

Formatted: Font: (Default) Arial, 10 pt, Not Italic

Deleted: Olin's June 30, 2006 *Llagas Subbasin Cleanup Feasibility Study* (Cleanup FS Report) and *Plume Migration Control Assessment Report Addendum*, included as Appendix C to the Cleanup FS Report. As requested by Chairman Young at the September 8, 2006 Water Board Hearing in Monterey, a copy of our October 6, 2006 Cleanup FS Report comment letter was mailed to each of the Central Coast Water Board members. ¶

¶
As explained in the October 6, 2006 comment letter, Central Coast Water Board staff determined that the Cleanup FS Report does not fully meet the requirements of ordering paragraph J. of Cleanup Order No. R3-2005-0014 and does not fulfill the cleanup objectives of Resolution No. 92-49. Thus, Central Coast Water Board staff did not approve the Cleanup FS Report and required Olin to take the following actions: ¶

¶
<#>Propose an appropriate and substantiated background perchlorate level in groundwater. ¶

<#>Propose reasonable and acceptable cleanup levels in groundwater within each of the affected aquifer zones of the Llagas Subbasin, if Olin wants the Water Board to consider cleanup level ... [1]

Deleted: (see page 5 of this report for additional information about Cleanup Order No. R3-2006-0112)

Deleted: Our objective is to issue a replacement cleanup order as soon as Central Coast Water Board has sufficient information about the ... [2]

Deleted: spring

Deleted: However, a critical part of the MRP revision includes evaluation of the existing sampling and validation program. Olin's exist ... [3]

Deleted: during the first quarter of 2007. ¶

Deleted: Recent

Deleted: ed

Deleted: On January 4, 2007,

Deleted: its review and prepared comments

- January 31, 2007, *Llagas Subbasin Characterization – 2006*, Santa Clara County Olin/Standard Fusee, Morgan Hill, California (2006 Characterization Report).
- January 30, 2007, *Fourth Quarter 2006, Groundwater Monitoring Report*, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill California (4th Monitoring Report).
- March 9, 2007, *Olin Response to Central Coast Water Board Comments concerning Second and Third Quarter 2006 Groundwater Monitoring Reports, and East of Site Characterization Report*.
- March 9, 2007, *Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan*, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California.

Update Concerning Assessment in Area Northeast of Tennant Avenue: Olin has continued implementation of a proactive step-wise approach of investigating the perchlorate detections in the area immediately east of the Olin site and north of Tennant Avenue. Olin continues to delineate the perchlorate detections in the intermediate aquifer (B1 and B2 zones) using additional CPT borings, and the deep aquifer zone by installing additional depth discrete multi-level wells. A new multi-level well, MP/PZ-05, was recently installed east of PZ-04 along the north side of Tennant Avenue. Construction of MP/PZ-05 is similar to the other MP/PZ wells in the area northeast of the Olin site and will be sampled quarterly for a minimum of one year. Recent assessment activities indicate that with the exception of CPT-OS-51-55, perchlorate was not detected in the shallow aquifer during the third quarter of 2006. However, in the intermediate aquifer, perchlorate was detected at up to 45 µg/L in grab groundwater samples collected from CPT-OS-21-90 and perchlorate was detected up to 4.0 µg/L in wells screened in the intermediate aquifer. In the deep aquifer zone, perchlorate was detected of up to 6.0 µg/L. Based on the results of recent characterization activities as reported in the East of Site Report, Olin proposed to install an additional monitoring well (well PZ-06) north of MP/PZ-04. Olin is required to provide a work plan that details well construction, installation schedules, and proposed well locations for PZ-06 by March 9, 2007.

Groundwater elevation monitoring in the MP/PZ wells located northeast of the Olin site continue to show a southeasterly direction of flow in the shallow and intermediate aquifers. Groundwater elevations in the deep aquifer show significant influence from municipal well operation and a northerly component of groundwater flow continues to exist in the area northeast of the Olin site.

On December 21, 2006, Central Coast Water Board staff issued Cleanup or Abatement Order No. R3-2006-0112, which amends Cleanup or Abatement Order No. R3-2005-0014. Order R3-2006-0112 clarifies Olin's responsibility to investigate perchlorate in groundwater east and northeast of the Olin site. The amendment was necessary to ensure that CAO Order No. R3-2005-0014 is consistent with the recent groundwater data, and to clarify that Olin is required to fully characterize the lateral and vertical extent and degree of groundwater pollution that originates from the Olin site. It continues to be Central Coast Water Board staff's position that site characterization activities are an ongoing process and that characterization activities will be continuously evaluated and modified based on investigation findings, site-specific conditions, and other pertinent factors. A copy of CAO Order No. R3-2006-0112 is attached as Attachment 3.

Monitoring in Northeast Area: The sharing of water level data between the City of Morgan Hill's consultant (WorleyParsons-Komex) and Olin's consultant (MACTEC) continued throughout the first part of 2007. The sharing of water level measurements from several City water supply wells and Olin's monitoring wells located northeast of Tennant Avenue has helped all parties gain a better understanding of water level fluctuations northeast of the Olin facility. Further, trace perchlorate concentration data provided by City of Morgan Hill from its municipal water supply wells and data collected by Olin from private domestic wells located north of the Olin site, indicate that concentrations of perchlorate are present at north and northeast of the site up to three-miles from the site.

Formatted: Font: Italic

Deleted: July 30, 2006 *Second Quarter 2006 Groundwater Monitoring Report* (2Q Monitoring Report).¶

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Bullets and Numbering

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Bullets and Numbering

Formatted: Font: Italic

Deleted: <#>September 29, 2006 *East of Site Characterization* (East of Site Report).¶

Deleted: The Monitoring Reports present the results of groundwater monitoring conducted by Olin during the second and third quarter 2006 monitoring periods. The 3Q On-Site Remediation Report documents the operation and performance of the on-site groundwater containment and perchlorate removal system and the on-site recharge system during the third quarter of 2006. ¶

¶ The East of Site Report provides information on the distribution of perchlorate east of the Olin site in the shallow and intermediate aquifer zones, as well as its presence in units within interlaying aquifers. ¶

Formatted: Strikethrough

Formatted: Strikethrough

Formatted: Strikethrough

Formatted: Strikethrough

Formatted: Strikethrough

Deleted: ¶

Formatted: Strikethrough

Deleted: 6

STATUS OF REMEDIATION ACTIVITIES

On-site Groundwater Treatment and Containment: Operation of the on-site groundwater treatment system continues uninterrupted. The treatment system began operation on February 23, 2004. Groundwater is extracted at a rate ranging from 50 to 175 gallons per minute (gpm). Extracted groundwater is filtered, and perchlorate is removed using an ion-exchange process. The treated groundwater is reinjected at a rate of 50 to 250 gpm. ~~As of March 3, 2006, treated groundwater is injected into the shallow (A-zone) aquifer using three injection wells located along the northern portion of the site. Two additional injection wells may be added in the future, if necessary. While the goal is to inject all effluent into the shallow aquifer, Olin retains the capability of discharging effluent to the Butterfield Retention Pond (as was the case prior to March 3, 2006) when deemed necessary during emergencies. Olin continues to evaluate the effectiveness of the extraction and re-injection system to ensure that hydraulic control is occurring. As of September 30, 2006, the treatment system had treated approximately 143 million gallons of extracted groundwater.~~

Formatted: Strikethrough

Deleted: ¶
¶

Formatted: Strikethrough

~~**On-site Ex Situ and In Situ Soil Treatment — Closure Report Approval:** On October 26, 2006, Central Coast Water Board staff completed its review and issued a closure approval letter concerning Olin's July 18, 2006 *Soil In Situ Bioremediation System Closure Report, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California* (Closure Report). The Closure Report documents the successful completion of soil remediation activities at the former Olin Site location.~~

Formatted: Strikethrough

~~The approved soil remedy included a two-phase remediation program for perchlorate-impacted soils. Phase I involved excavation and ex-situ treatment of soils (approximately 1,000 cubic yards) containing perchlorate concentrations above the USEPA Residential Preliminary Remediation Goal of 7.8 milligrams per kilogram (mg/kg). Phase II included in-situ bioremediation (ISB) of remaining soils (approximately 40,000 cubic yards) containing perchlorate concentrations above the Central Coast Water Board specified remediation goal.~~

Formatted: Strikethrough

~~Phase I was initiated in July 2004, and performance monitoring conducted in April 2005 indicated successful completion of the ex-situ remediation program. Phase II was initiated in May 2005. According to the Closure Report, the ISB system achieved the remediation objectives in less than 10 months of operation, more than 14 months ahead of schedule. For both phases of remediation, performance monitoring results indicate that the soils were effectively treated and achieved the Central Coast Water Board's remedial goal of 0.05 mg/kg.~~

~~In addition to reviewing the subject report and to confirm the reported results, Central Coast Water Board staff reviewed first and second quarter 2006 performance monitoring reports.~~

UPDATE CONCERNING OTHER POTENTIAL SOURCES

Central Coast Water Board staff has concluded its investigation at a mushroom farm located north of the City of Morgan Hill's Nordstrom Well. In March 2006, perchlorate was detected in the mushroom farm's surface wastewater pond at 17 µg/L. The mushroom farm owner was required to collect a first encountered groundwater sample to evaluate if perchlorate impacts had reached underlying groundwater. The results of the investigation indicate that **no** perchlorate was detected above the MDL of 1.3 µg/L in groundwater beneath the wastewater pond that had been identified to contain perchlorate in March 2006.

To date, none of the other potential perchlorate sources identified by Olin have been investigated to determine if any of them are contributing to groundwater impacts. Therefore, until it is confirmed with data, Central Coast Water Board staff believes it is plausible that the source(s) of perchlorate concentrations detection could include the Olin site as well as any of the other identified potential sources.

PERCHLORATE COMMUNITY ADVISORY GROUP

The Perchlorate Community Advisory Group (PCAG) meets monthly in San Martin. The advisory group is a forum for public discussion of the perchlorate problem and potential solutions. Central Coast Water Board staff solicits advisory group input at key decision points in the investigation and cleanup process.

The next PCAG meeting will be held at the San Martin Lions Club on Friday, February 2, 2007, at 2 pm. Central Coast Water Board staff will attend and be available to address questions from the public concerning the ongoing Olin cleanup issues.

Olin Reports and Significant Correspondence can be accessed on our website at:

<http://www.swrcb.ca.gov/rwqcb3/Facilities/Olin%20Perchlorate/Olinsite.htm>

Whittaker Ordnance Facility, 2751 San Juan Road, Hollister, San Benito County
Project Manager: Kristina Seley: 805-549-3121

Note: *New information concerning the following sites is shown in italics.*

Remedial Design/Remedial Action Work Plan (Work Plan): On May 28, 2006, Central Coast Water Board staff received Whittaker's "Remedial Design/Remedial Action Work Plan" (Work Plan). The Work Plan contains the remediation strategy for perchlorate, hexavalent chromium, and volatile organic compounds (VOCs) contamination in soil and groundwater on and off of the site. The Work Plan includes a design description, rationale, and schedule to mitigate the soil and groundwater impacts. The Work Plan includes design of a groundwater extraction and treatment system, plans to fill hydrogeologic data gaps, plans to conduct an additional source area investigation, and plans to decommission two offsite agricultural wells.

Groundwater Extraction and Treatment System: The purpose of the proposed groundwater extraction and treatment system is to contain groundwater migrating from the site to reduce the risk of impacting off-site groundwater beneficial uses. After the on-site groundwater is extracted, Whittaker will treat and discharge the water into the San Benito River (approximately 2000 feet north of the Site boundary) under a General NPDES permit for Discharges of Highly Treated Groundwater to Surface Waters. The treatment system consists of granular activated carbon for VOC removal and a bioreactor for perchlorate remediation.

Whittaker has installed six extraction wells for the groundwater extraction and treatment system. However, Whittaker has not completed construction of the treatment system. The system is anticipated to begin operation in summer of 2007. On December 7, 2006, the Water Board approved the reissued General NPDES Permit for Discharges of Highly Treated Groundwater. Staff informed Whittaker on December 19, 2006, of the revisions and requirements that they must comply with by February 19, 2007, to remain enrolled in the General NPDES permit.

Additional Hydrogeologic Assessment On December 22, 2006, Whittaker submitted the "Hydrogeologic Data Gap Investigation and Well Installation Report." The report presents results from the soil borings, new groundwater monitoring wells, and groundwater extraction wells and it evaluates aquifer performance through pump tests to fill data gaps necessary for the design of the treatment system. Water Board staff anticipate completing review of the report by March 1, 2006.

Offsite Agricultural Wells: In the RD/RA Work Plan, Whittaker proposed to decommission the Riverside and Christopher agricultural wells to reduce the vertical migration of contaminants. The

agricultural wells are screened across multiple deep aquifer units. Whittaker first focused on the Christopher well located approximately 200 feet west of the property boundary.

Christopher Well: On November 2, 2006, staff approved the Perry Farms Replacement Well Work Plan received October 30, 2006. The Work Plan presents Whittaker's proposed scope of work for installing an agricultural supply well to replace the Perry Farms' existing Christopher well. The Christopher well was identified as a possible vertical conduit for migration of contaminants from the Whittaker Facility. Therefore, Whittaker must abandon the well and provide replacement water supply to the Perry Farms. The Work Plan proposed to install a sampling well (SW-1) to obtain design data for the Perry Farms well. Depending on the results, Whittaker will install new monitoring wells screened across the deeper aquifer zones to serve as an early warning sign of lateral or vertical migration between the site and the new agricultural supply well. Following two telephone conference calls, staff provided comments to the September 20, 2006 draft work plan via email on September 27, 2006. Whittaker's consultants provided an adequate response to our comments in a document dated October 24, 2006. As discussed via phone, Whittaker will begin drilling the sampling well on December 26, 2006, and provide well logs for staff review. Pending the results, Whittaker will install the new monitoring wells.

Riverside Well: The RD/RA Work Plan proposed to decommission the well to mitigate possible vertical migration of COCs. Whittaker is required to submit a schedule with key milestones for decommissioning the Riverside well by January 30, 2007. The Riverside well has had detections of perchlorate and volatile organic compounds (VOCs).

Additional Source Area Investigation: Central Coast Water Board staff reviewed Whittaker's March 28, 2006 "Potential Source Area Investigation Work Plan." The Work Plan was prepared in accordance with the Central Coast Water Board's request to conduct additional soil investigations at North Building 5 and Building 23. The Work Plan identified data gaps and proposed additional soil gas and soil sampling to further delineate TCE impacts beneath the two buildings.

On July 26, 2006, Central Coast Water Board staff engineer Kristina Seley conducted a site inspection and met with Whittaker's consultants. The consultants reviewed the preliminary VOC soil gas and soil sampling results collected at 5, 10, and 20 feet below ground surface from the source areas near Buildings 5 and 23. In addition, Ms. Seley and the consultants discussed step-out soil gas and soil sampling locations to delineate soil gas impacts.

On December 18, 2006, staff received the "Preliminary Phase I Soil Gas Investigation Report and Phase II Work Plan Addendum." The soil gas report provides a progress report of the Phase I soil gas investigation at Buildings 5 and 23 and proposes an approach for additional characterization of dissolved-phase TCE in the vadoze zone (Phase II). In addition Whittaker's consultant conducted a pilot test to evaluate soil gas sampling methods. Staff is currently reviewing the work plan and anticipates approving the work plan by the February Board Meeting.

Sampling and Analysis Plan: Staff reviewed and approved the December 4, 2006 Request to Modify the Current Sampling and Analysis Plan (SAP). The SAP details groundwater, soil, and treatment system monitoring and reporting activities for the Whittaker Ordnance Facility. Whittaker submitted the "Sampling and Analysis Plan Addendum No. 1" that includes replacement pages for the SAP on December 21, 2006. In our December 22 correspondence, staff concurred with the seven modifications proposed in the SAP document, including changes to the groundwater monitoring frequency for COCs, removal of wells that have been decommissioned, and inclusion of newly installed monitoring wells. Staff also provided comments regarding the quarterly monitoring reports.

BAE Systems (former United Defense), 900 John Smith Road, Hollister, San Benito County
Project Manager: Kristina Seley 805-549-3121

Background: BAE Systems has conducted military armor and tracked vehicle testing since 1968. The site, located on approximately 1,200 acres, is developed with several buildings, former munitions magazines, and two munitions test arenas. Constituents of concern identified in soil and/or groundwater include perchlorate and explosives.

Cleanup Actions: In late September 2005, BAE Systems excavated shallow perchlorate-impacted soils in Arena 1 at concentrations greater than 5 milligrams per kilogram (mg/kg). BAE Systems removed approximately 400 cubic yards of soil and installed a 35,000 square foot temporary chip seal cap at Arena 1 to minimize potential mobilization associated with rainfall and runoff infiltration.

Current Investigation: On October 2, 2006, BAE Systems submitted the "Phase VI Environmental Investigation Report" (Phase VI Report) concurrent with the October 27, 2006 "Third Quarter 2006 Monitoring Report." The Phase VI Report includes the results BAE System's sixth phase of the environmental investigation at the Test Facility. The Third Quarter Monitoring Report, prepared in accordance with Monitoring and Reporting Program No R3-2005-0113, includes analytical results from 24 on-site wells, groundwater gradient and flow direction, and activities planned for the following quarter. The following areas were investigated during the Phase VI environmental investigation. Water Board staff provided comments to the Phase VI Report in a December 11, 2006 correspondence. An area summary, Phase VI Report recommendations, and our response to BAE System's recommended way ahead are included below.

Building No. 3: Building No. 3 housed a hydraulic-powered, heated-platen press to process munitions. Phase VI included the placement of two geoprobe borings to further assess any soil or groundwater impacts. The results showed no energetics in soil or groundwater samples; however, perchlorate was detected in groundwater samples at concentrations of 89 micrograms per liter ($\mu\text{g/L}$) and 130 $\mu\text{g/L}$. The Phase VI Report recommended further investigation measures including a historic investigation to identify potential source areas, then a focused geoprobe investigation in unsaturated zone soils, and advancement of temporary piezometers and at least three borings to 100 feet bgs with continuous core sampling groundwater samples. Staff concurred with the Phase VI Report recommendations and requested that BAE Systems plan to install monitoring either during the next phase of investigation or following the three proposed borings.

Arena 1: The Arena 1 area is the main area of concern with perchlorate and explosive impacts and has undergone extensive soil, groundwater, and drainage stormwater sampling since Phase II. The Phase VI Report suggests that the main mass of perchlorate appears to be in the upper five feet of soil within the Arena. The Phase VI Report also suggests that the southern downgradient extent of perchlorate is limited to the drainage channel area leading westward out of Arena 1, further investigation is necessary at the downgradient end of the perchlorate groundwater plume.

The Phase VI Report recommended further investigation including: 1) continued quarterly groundwater monitoring; 2) the installation of additional borings to the northeast and northwest of the downgradient toe of the plume; 3) installation of an additional monitoring well; and 4) continued monitoring and use of the interim remedial action plan chip seal cap to minimize soil infiltration to groundwater and transport from the drainage system. Water Board staff concurred with all of the Phase VI Report recommendations.

Building No. 4: Building No. 4 housed equipment for x-ray film processing and a spent film developer. Prior to 1993, rinse water from the spent film developer was discharged into an outdoor sink and underground drainage system. Neither perchlorate nor energetics were detected during the Phase VI soil borings and grab groundwater samples. The Phase VI Report recommended characterization is complete in the Building No. 4 Area. Any further corrective actions on the soil

perchlorate detections will be based on the Risk Assessment and Feasibility Study results. Staff concurs with the recommended completion of the Building No. 4 Area characterization.

Building No. 6 Area: BAE Systems completed a total of 26 soil borings from Phase I to VI, with analysis of 98 soil samples. Energetics have been detected in 15 of the 26 borings. Based on the current data, energetics in the Building No. 6 Area are concentrated in two areas: 1) the former wastewater clarifier area, and 2) the Building No. 6 entrance road area. BAE Systems also detected explosives at low concentrations (less than 20 µg/L) in groundwater samples.

The Phase VI Report concluded that characterization is complete in the Building No. 6 Area, but staff does not concur at this time. Staff requested BAE Systems to install monitoring wells to determine groundwater temporal trends. For soil impacts, staff requested a map with all historical data that shows iso-concentration contour lines for varying sample depths. Staff cannot concur that the soil investigation is complete.

Building No. 1 Area: Rain runoff from metal parts and equipment storage may have resulted in low detections of perchlorate in soil and groundwater. Perchlorate was detected in five of the 22 soil borings drilled at concentrations ranging from 0.015 mg/kg to 0.16 mg/kg. The Phase VI Report recommended that characterization is complete in the Building No. 1 Area and staff concurred.

BAE Systems will complete the Phase VI Work Plan recommendations as described above and submit its soil and groundwater results and conclusions in the "Phase VI Environmental Investigation Report" by March 1, 2007.

Proposed Soil Cleanup Values: On February 28, 2006, Central Coast Water Board staff received the "Human and Ecological Risk Assessment." The risk assessment proposed soil cleanup values based on the risk to potential receptors (human, ecological, and groundwater). Water Board staff requested Office of Environmental Health Hazard Assessment (OEHHA) assistance with the risk assessment review. OEHHA completed its review of the risk-based soil cleanup values proposed based on the protection of human health and ecological receptors. Staff completed its review of the risk-based soil cleanup values proposed based on the protection of groundwater and provided comments to BAE Systems on July 28, 2006.

BAE Systems submitted a response to Water Board staff comments on August 30, 2006. Water Board staff and OEHHA are coordinating a review of the response document and anticipate providing final comments prior to the Central Coast Water Board meeting.

MK Ballistic Systems, 2707 Santa Ana Valley Road, Hollister, San Benito County
Project Manager: Kristina Seley 805-549-3121

Background: The MK Ballistic Systems site is located west of the BAE Systems Test Facility property. Currently, MK Ballistic Systems leases buildings and storage magazines on the five-acre property and manufactures "less-lethal" explosives and ordnance components and devices. Numerous other tenants have conducted similar operations at the facility and have used perchlorate and other explosive compounds in their manufacturing processes. In 1991, U.S. EPA conducted a time-critical cleanup action when one of the former tenants, Caelus Devices, Inc., went bankrupt and abandoned the facility without proper containment and storage of shock-sensitive explosive chemicals.

Concern: BAE Systems tested all its site wells for chemicals of concern. Perchlorate was detected for three consecutive quarters at about 30 ppb in a windmill well upgradient from all identified soil and groundwater perchlorate impacts. BAE Systems' *Phase IV Environmental Investigation Report* proposed that historical use of perchlorate at the neighboring site, MK Ballistic Systems, may be the

cause of contamination. Based on the historical use of perchlorate and explosives at MK Ballistic Systems, and due to the perchlorate detections in the windmill well, staff believe that current or past practices at the MK Ballistics site may have impacted groundwater.

Action: On January 9, 2006, Central Coast Water Board staff met with the landowner, her attorney and environmental consultant, and the current operator at the facility to discuss our concern that past practices may have impacted the windmill well. In a January 24, 2006 letter, the Central Coast Water Board directed the landowners and current operator to provide a work plan by March 24, 2006. The requested work plan must include a summary of historical practices, proposed investigation tasks, sampling and analysis plan, and time schedule.

On April 14, 2006, staff received the "MK Ballistic Systems Site Environmental Investigation Work Plan." The work plan summarized historical site operations and proposed a perchlorate soil and groundwater investigation. Water Board staff generally concurs with the work plan, and provided comments in a June 23, 2006 letter. Subsequently, staff discussed our comments with the consultant, who will proceed with the proposed soil and groundwater sampling this summer. MK Ballistic Systems' landowner and lessee are required to submit a summary of their findings and an interpretation of the data in an Environmental Investigation Report.

Water Board staff was contacted by the Department of Toxics Substance Control (DTSC) regarding this site. Currently, DTSC is investigating the storage and handling of hazardous waste and explosives contained at the site. Water Board staff requested that the consultant not conduct any work or access the site at this time while DTSC completes all investigative activities. DTSC and Water Board staff are working together to determine when the approved groundwater investigation will begin.

ATTACHMENTS

1. Olin's Progress Report #53, dated January 8, 2007
2. Central Coast Water Board October 6, 2006 Termination of Replacement Water and Post Monitoring Requirements letter.
3. Central Coast Water Board Cleanup or Abatement Order No. R3-2006-0112 Amending Cleanup or Abatement Order No. R3-2005-0014, issued December 21, 2006.

Olin's June 30, 2006 *Llagas Subbasin Cleanup Feasibility Study* (Cleanup FS Report) and *Plume Migration Control Assessment Report Addendum*, included as Appendix C to the Cleanup FS Report. As requested by Chairman Young at the September 8, 2006 Water Board Hearing in Monterey, a copy of our October 6, 2006 Cleanup FS Report comment letter was mailed to each of the Central Coast Water Board members.

As explained in the October 6, 2006 comment letter, Central Coast Water Board staff determined that the Cleanup FS Report does not fully meet the requirements of ordering paragraph J. of Cleanup Order No. R3-2005-0014 and does not fulfill the cleanup objectives of Resolution No. 92-49. Thus, Central Coast Water Board staff did not approve the Cleanup FS Report and required Olin to take the following actions:

- Propose an appropriate and substantiated background perchlorate level in groundwater.
- Propose reasonable and acceptable cleanup levels in groundwater within each of the affected aquifer zones of the Llagas Subbasin, if Olin wants the Water Board to consider cleanup levels above background.
- Perform a thorough evaluation of groundwater remedial alternatives.
- Complete and submit a revised Cleanup FS Report by December 6, 2006.
- Expedite active remediation in Area I by:
 - Completing a Plume Migration Control Feasibility Study by December 6, 2006.
 - Preparing an Area I Cleanup Work Plan by December 6, 2006.

Olin submitted the reports requested by the established deadlines, and as of the date of this staff report, staff is in the process of reviewing them. Staff intends to clarify its review findings at the February Board Meeting.

Our objective is to issue a replacement cleanup order as soon as Central Coast Water Board has sufficient information about the feasibility of groundwater cleanup.

However, a critical part of the MRP revision includes evaluation of the existing sampling and validation program. Olin's existing "Sampling and Analysis Plan" and "Quality Assurance Project Plan" are nearly four years old and must be updated. Considering that the Central Coast Water Board staff intends to reference the updated Sampling and Analysis Plan and Quality Assurance Project Plan in the revised MRP for the Olin cleanup case, Olin has been required to provide an update to the sampling and analysis plan and quality assurance project plan by no later than March 9, 2007.